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A STUDY OF THE VARIABLE COMPOSITION OF COTTON SEED

A Preliminary Report

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A STUDY OF THE VARIABLE COMPOSITION OF COTTON SEED

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Introduction

The idea that all cotton seed are of equal value in the hands of the oil miller, unless they have spoiled or become damaged is rather prevalent in the minds of growers, and still exists in the minds of some of those engaged in the crushing of cotton seed. During the last ten or fifteen years the more progressive of the oil millers have appreciated the fact that cotton seed varies widely in composition and therefore in the quantity of the extractable products, and they have taken advantage of this information in their purchases of seed.

Because of these variables and in the absence of a method of grading, considerable confusion as to the basis of purchases has existed in the industry, and the producers and dealers in cotton seed have not received value commensurate with the quality of the different lots of the seed produced and offered for sale to the oil mills.

A number of efforts have been made in the past to devise a method for grading cotton seed for crushing purposes, but none of the plans heretofore suggested has proved practicable. In the Spring of 1929 a plan was reported by the author, 1/ in which the two chief ingredients of cotton seed, oil and ammonia, were reduced to similar terms so that the quantitative relation of any lot of cotton seed could be determined relative to a basis description of seed.

The grade, or percentage relation, is determined by the following formula: Twenty times the percentage of oil plus fifty times the percentage of ammonia, divided by 5.55, equals the index or grade. Grade 100 is the basis for price quotation. Cotton seed having a grade above 100 are premium seed, and those having a grade below 100 are discount seed.

This plan for grading cotton seed was adopted by the National Cottonseed Products Association at its annual convention in New Orleans in May, 1930, and became a trading rule covering purchases of cotton seed produced in 1930. 2/

1/ Meloy, G. S., before the Interstate Cottonseed Crushers' Association, and published in the Cotton Oil Press, June, 1929.
2/ Rule 40. Trading Rules National Cottonseed Products Association, 1930-1931.

Under the plan of grading cotton seed it is necessary to analyze samples of the seed to determine the percentages of oil and ammonia. It thus became necessary to determine the factors that might affect the sufficiency of the sample and accurate methods of analyzing samples of cotton seed. For this purpose an interbureau committee was appointed, known as the Committee on Methods of Sampling and Analyzing Cotton Seed. 3/

On April 14, 1930, at Hot Springs, Arkansas, this committee presented a preliminary report of its findings. This report was the basis of Rules 240 and 270, governing the sampling and handling of cottonseed samples and analyzing cotton seed, which were approved by the American Oil Chemists Society and adopted by the National Cottonseed Products Association at their conventions in May, 1930.

The data presented in this report show the wide range of variation of the two principal ingredients, oil and ammonia, found in different lots of cotton seed, and demonstrate the desirability of grading this valuable seed crop of the South. Heretofore, purchases have been made on the estimated average value of the seed produced in the various sections, as might be affected temporarily by local climatic or cultural conditions.

Variations in Composition of Cotton Seed of Different Crops

A study of the variations in composition of cotton seed produced in each county of each State in the Cotton Belt has been undertaken in the hope that some facts might be found regarding the factors influencing the elaboration of oil and ammonia in cotton seed. This is the first study of this kind that has been made and little or no information relative to previous seasons is available with the exception of some incomplete reports from Nueces County, Texas. For this county sufficient data, covering seed produced in the years 1928, 1929, and 1930 are available for partial comparisons.

For the purpose of these studies, each analysis of cotton seed has been treated as covering comparable quantities of seed. The analyses were procured through the cooperation of the official chemists designated by the National Cottonseed Products Association and of the chemical laboratories connected with several of the cottonseed oil mills.

For the purpose of showing the relationship of relative percentages of oil and ammonia in the seed to grade, the analyses for each season have been grouped into classes based on oil content, each class representing a range of 1 per cent in oil content. Hereafter these classes are referred to by number, as class 15, to include those analyses in which the percentage of oil was between 15.00 per cent and 15.99 per cent.

3/ This committee consists of Mrs. W. W. Skinner, C. S. Jamieson and J. A. LeClere of the Bureau of Chemistry and Soils, and G. S. Meloy of the Bureau of Agricultural Economics, Chairman.

In the first column of Tables 1, 2, 3, 6, 7, 8, 9, and 10 are shown the percentages of all analyses made which fell into each of these classes.

Of the cotton seed grown in Nueces County, Texas, in 1928 the lowest class into which any of the analyses fell was class 10, and 2 per cent of the samples analyzed fell in this class.

The lowest class of cotton seed produced in 1929 was class 14. Of the samples analyzed that year, 3.5 per cent fell in this class.

The lowest class of cotton seed produced in 1930 was class 15, and 1.8 per cent of the analyses fell in this class.

The lowest oil content reported for seed produced in the year 1928 was 10.57 per cent, and the highest was 18.67 per cent. (Table 1.) Of the seed produced in the year 1929, the lowest oil content reported was 21.41 per cent. (Table 2.) In the year 1930 the lowest oil content was found to be 15.55 per cent, and the highest, 20.24 per cent. (Table 3.)

Although there is a wide range of variation in the ammonia content in each of these classes, especially in class 17 in the year 1930 (Table 3.), where the variation in ammonia content was from 3.34 per cent to 4.70 per cent the inverse ratio 4/ between the percentage of ammonia and of oil is apparent from the columns of weighted average oil and weighted average ammonia for the crops of both 1929 and 1930.

Cotton seed produced in Nueces County, Texas, were bought and sold on grade for the first time during the season of 1930. The grades given in Tables 1 and 2 (1928) (1929) have been calculated to show what grades would have obtained if the grading of cotton seed had been in operation during those seasons.

The available yields of oil were calculated by the formula: 5/ Percentage of oil multiplied by 2,000, minus 65, equals pounds of available oil. Different lots of seed produced in Nueces County, Texas, in 1928 varied in available oil per ton of seed from 146.4 pounds to 308.4 pounds. In seed produced in 1929 the variation in available oil ranged from 215.4 pounds to 363.2 pounds. The variation in available oil in cotton seed produced in the year 1930 was more narrow than during either of the two previous years, ranging from 246.0 pounds to 399.8 pounds.

The available 8-per-cent-ammonia cake (41.13 per cent protein) per ton of seed was calculated by the following formula: 5/ Percentage of ammonia multiplied by 0.925, multiplied by 2,000 and divided by 8, equals available pounds of 8-per-cent-ammonia cake.

4/ Woley, C. S., Grading Cotton Seed, Oil and Fat Industries, September, 1927.
5/ Standard of manufacturing efficiency of the National Cottonseed Products Association and American Oil Chemists Society.

Table 1. - Analyses of 429 samples of cotton seed grown in Moscow County, Texas, 1938

Class	Percentage in class	Oil content		Arsenic content		Grade		Weighted averages		
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Oil	Arsenic	Grade
		Per cent	Per cent	Per cent	Per cent			Per cent	Per cent	
10	2.0	10.57	10.99	4.07	4.43	75.2	78.0	10.64	4.25	76.6
11	2.0	11.00	11.99	4.15	4.16	77.0	77.6	11.06	4.15	77.2
12	4.0	12.00	12.99	4.35	4.69	83.5	88.4	12.65	4.52	85.9
13	5.1	13.00	13.99	4.32	4.67	86.5	91.0	13.46	4.46	88.7
14	8.0	14.00	14.99	4.32	4.71	90.1	96.3	14.53	4.53	93.2
15	16.2	15.00	15.99	4.19	4.94	92.7	101.2	15.51	4.55	97.3
16	31.4	16.00	16.99	4.18	4.83	97.4	103.7	16.49	4.53	100.2
17	25.2	17.00	17.99	4.30	4.65	99.8	105.4	17.44	4.45	102.9
18	10.1	18.00	18.67	4.17	4.59	103.5	108.3	18.25	4.40	105.4
All classes	100.0	10.57	18.67	4.07	4.94	75.2	108.3	16.16	4.49	98.7

Table 2. - Analyses of 603 samples of cotton seed grown in Nueces County, Texas, 1929

Class	Percentage in class	Oil content		Ammonia content		Grade		Weighted averages		
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Oil	Ammonia	Grade
		Per cent	Per cent	Per cent	Per cent			Per cent	Per cent	
14	3.5	14.02	14.99	3.95	4.50	86.5	94.0	14.57	4.12	89.6
15	7.0	15.00	15.99	4.05	4.38	91.6	96.4	15.56	4.22	94.1
16	21.7	16.00	16.99	3.89	4.51	93.4	100.3	16.53	4.17	97.2
17	21.1	17.00	17.99	3.88	4.51	96.7	103.6	17.52	4.15	100.5
18	13.9	18.00	18.99	3.67	4.45	98.9	106.1	18.46	4.04	103.9
19	17.6	19.00	19.99	3.67	4.27	103.0	110.1	19.54	3.97	106.2
20	11.7	20.00	20.99	3.69	4.32	105.3	111.2	20.41	3.84	108.2
21	1.5	21.00	21.41	3.67	4.02	109.4	113.4	21.30	3.84	111.4
All classes	100.0	14.02	21.41	3.89	4.51	86.5	113.4	17.89	4.07	101.1

Table 3. - Analyses of 1016 samples of cotton seed grown in Nueces County, Texas, 1930

Class	Percentage in class	Oil content		Ammonia content		Grade		Weighted averages		
		Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Oil	Ammonia	Grade
		Per cent	Per cent	Per cent	Per cent			Per cent	Per cent	
15	1.8	15.55	15.99	4.11	4.56	93.2	97.0	15.70	4.30	95.3
16	29.4	16.00	16.99	3.93	4.65	95.2	102.3	16.52	4.34	99.0
17	46.7	17.00	17.99	3.34	4.70	94.6	105.3	17.49	4.38	102.5
18	20.1	18.00	18.99	3.98	4.62	98.7	106.3	18.34	4.30	103.1
19	1.6	19.00	19.99	3.89	4.33	103.1	108.2	19.21	4.15	106.6
20	0.4	20.00	20.24	3.70	4.39	106.3	111.6	20.12	4.04	108.9
All classes	100.0	15.55	20.24	3.34	4.70	93.3	111.6	17.40	4.35	101.9

The available 8-per-cent-ammonia cake in different lots of seed grown in Nueces County, Texas, during the year 1928 varied from 841.1 pounds to 1142.3 pounds, a spread of 301.2 pounds. During the year 1929 the available 8-per-cent-ammonia cake in different lots of cotton seed in the county varied from 830.1 pounds to 1042.9 pounds, or a spread of 212.8 pounds. While the range of available oil in the seed produced in 1930 narrowed, the range of available 8-per-cent-ammonia cake widened, the range being from 773.2 pounds to 1086.8 pounds, a spread of 313.6 pounds.

Table 4 presents in summary form the range of available oil and of available 8-per-cent-ammonia cake, the spread, and the weighted averages of the seed produced in Nueces County, Texas, in each of the three seasons.

Table 4. - Available oil and 8-per-cent-ammonia cake per ton of cotton seed grown in Nueces County, Texas, 1928-1930

Year	Available oil, per ton of seed				Available cake, per ton of seed			
	Min.	Max.	Spread	Weighted average	Min.	Max.	Spread	Weighted average
	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds
1928	146.4	308.4	162.0	258.3	841.1	1142.3	301.2	1038.3
1929	215.4	363.2	147.8	292.8	830.1	1042.9	212.8	941.1
1930	246.0	339.8	93.8	283.0	773.2	1086.8	313.6	1006.0

Possible Influence of Rainfall on the Composition of Cotton Seed

In Nueces County, Texas, the harvesting of cotton begins the last of July and is practically completed by the end of September. Therefore the growing season for cotton may be regarded as ending with July. For the purpose of studying the climatic conditions that might influence the development of the plant and the elaboration of oil and protein in the seed, the year may be considered as beginning with August and ending with the following July. An examination of the mean monthly temperatures during the period August, 1927, through July, 1930, shows no significant differences, but there are significant differences in the rainfall. (Table 5.)

In Table 5 the data have been grouped by months and periods of the year. The months August to December are grouped together to show the moisture conditions during harvest as well as the pre-season moisture supply for the crops of the following year; January to May, inclusive, to show the distribution of precipitation during the growing period of

the cotton plants; June and July, to show the distribution and amount of rainfall during the period of growth and development of the bolls.

The 1928 crop of cotton seed was grown on a total of 18.95 inches of rainfall, of which 7.48 inches fell in the months of January, February, March, April, and May. The fruit was matured on 7.32 inches, which fell in June and July, 6.99 inches of which fell in June.

The 1929 crop of cotton seed was grown on a total of 37.98 inches, of which 7.96 inches fell from January to May, inclusive. The fruit was matured on 5.37 inches, which fell in June and July, of which 1.59 inches fell in June.

The 1930 crop of cotton seed was grown on a total of 21.38 inches, of which 9.24 inches fell from January to May, inclusive. The fruit was matrued on 1.98 inches, of which 0.69 inches fell in June.

Considering August and September as the principal harvest months, the three crops were harvested under precipitations of 17.18 inches in 1928; 5.34 inches in 1929; and 4.04 inches of rain in 1930.

The distribution of the rainfall during the months of January to May, inclusive, was more uniform in 1930, and possibly more nearly ample, than in either 1929 or 1928.

The precipitation in the month of June is possibly significant, especially since heavy rainfall is frequently followed by heavy boll weevil infestation. In June, 1928, 6.99 inches fell; in June 1929, 1.59 inches; and June, 1930, 0.69 inches. The seed produced in 1928 were the most irregular in composition, those produced in 1930 were the most uniform in composition, and those produced in 1929 were intermediate in regularity of composition.

Table 5. - Precipitation in [illegible] County, Tex[illegible]
1927 to 1930

Month	1927-28	1928-29	1929-30	1930
	Inches	Inches	Inches	Inches
August	1.55	1.79	1.59	0.32
September	2.93	15.69	1.65	3.72
October	1.99	4.07	1.69	7.72
November	3.11	3.09	3.07	—
December	2.09	4.78	2.14	—
Pre-season subtotal	11.47	29.12	10.14	—
January	2.22	0.62	0.75	—
February	1.68	0.06	0.36	—
March	1.06	1.06	2.21	—
April	0.50	.86	1.36	—
May	2.00	5.34	4.37	—
Development subtotal	7.48	7.56	9.24	—
Growth subtotal	18.96	37.08	21.38	—
June	3.99	1.39	0.69	—
July	0.33	7.78	1.20	—
Boll-maturing subtotal	7.32	9.37	1.94	—
Total	26.27	47.69	23.33	—

Variations in Composition of Cotton Seed During a Season

The cotton seed produced in Nueces County, Texas, in 1930 were bought and sold on grade and therefore were perhaps more completely analyzed than seed produced during any previous season. Approximately, one analysis was made to every 50 tons of seed available for crushing. A record was kept of the dates on which each lot of seed analyzed was produced at the gins. Tables 6, 7, and 8 show these analyses classified and tabulated according to the months in which the seed were produced.

Of the seed produced in 1930, 45.6 per cent was harvested in August; 44.7 per cent in September; and 9.7 per cent in October.

During the month of August, 1930 (Table 6), one half of one per cent of the cotton seed analyzed were found in class 15; 14.2 per cent of the shipments fell in class 16; 46.7 per cent in class 17; 34.3 per cent in class 18; 3.8 per cent in class 19; and one half of one per cent in class 20. The lowest oil content of any lot of seed analyzed was 15.76 per cent, and the highest was 20.24 per cent.

During August the lowest actual moisture content reported, 5.70 per cent, was found in class 17; and the highest actual moisture content, 11.98 per cent, was found in class 16. The lowest weighted average moisture content was found in the seed in class 15.00. A gradual increase in the moisture content is shown from class to class, the highest weighted average moisture content, 8.77 per cent, being found in class 20.

These comparisons might indicate that approximately 8 per cent moisture in the seed is normal for cotton seed in Nueces County, Texas, and that subnormal moisture is correlated with retarded elaboration of oil in the seed.

The ammonia content of different lots of seed delivered during August ranged from 3.69 per cent to 4.61 per cent.

The weighted average oil content for the month was 17.76 per cent; ammonia content 4.34 per cent; and grade, 103.1. Only one analysis of seed delivered during August showed that the seed contained in excess of 1.8 per cent free fatty acids. This lot of cotton seed contained 3.9 per cent free fatty acids and may have been seed held over from the previous season.

During September, 1930 the lowest oil content in any lot of seed was found to be 15.55 per cent, and the highest, 18.88 per cent. (Table 7.) Both the lowest ammonia content, 3.34 per cent, and the highest ammonia content, 4.70 per cent, in seed produced in the season of 1930, was found in seed delivered in September. Both were found in class 17. The only other analysis during the season showing excess free fatty acids occurred in September, the content being 1.9 per cent.

The weighted average oil content of seed analyzed dropped from 17.76 per cent in August to 17.18 per cent in September and to 16.87 per cent in October.

Of the seed produced in August, 1930, 3.8 per cent was in class 19, and one half of one per cent of the analyses fell in class 20, but no seed produced in Nueces County, Texas in either September or October, 1930, was found above class 18.

The percentage of the analyses that fell in class 15 increased from 0.5 per cent in August to 1.9 per cent in September, and to 7.7 per cent in October.

The average available oil per ton of seed (Table 9) was 290.2 pounds in August, 278.4 pounds in September, and 273.4 pounds in October.

The average available 8-per-cent-ammonia cake per ton of seed was 1003.6 pounds in August, 1010.5 pounds in September, and 992.0 pounds in October.

Available oil per ton in different lots of seed analyzed showed a range of 89.6 pounds during August, 66.6 pounds during September, and 69.2 pounds during October.

In the seed produced during August, a difference of 112.7 pounds per ton of seed was found in available 8-per-cent-ammonia cake. In seed produced during September, the spread in available 8-per-cent-ammonia cake was 313.6 pounds. In seed produced during October, the spread between different lots of seed in available 8-per-cent-ammonia cake was 120.3 pounds.

The weighted average percentage of ammonia increased from 4.34 per cent in August to 4.37 per cent in September and dropped to 4.29 per cent in October.

Table 6. - Analyses of samples of cotton seed produced in Muscogee County, Texas, August, 1930

Class	Percentage in class	Oil content		Ammonia content		Grade		Moisture		Weighted averages			
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Oil	Ammonia	Grade	Moisture
		Per cent	Per cent	Per cent	Per cent			Per cent	Per cent	Per cent	Per cent		Per cent
15	6.5	15.76	15.99	4.14	4.39	95.9	97.0	6.87	7.26	15.95	4.26	96.4	7.06
16	14.2	16.00	16.99	3.93	4.57	95.2	102.3	5.81	11.98	16.62	4.27	99.3	7.70
17	46.7	17.00	17.99	4.06	4.61	99.2	105.3	5.70	10.05	17.55	4.27	102.6	7.35
18	34.3	18.00	18.99	3.98	4.58	102.3	108.2	6.10	10.60	18.26	4.33	105.2	7.53
19	3.8	19.00	19.99	3.69	4.33	103.1	108.2	6.36	9.20	19.11	4.15	106.3	7.78
20	.5	20.00	20.34	3.70	4.79	106.3	111.6	8.00	9.55	20.12	4.04	108.3	8.77
All classes	100.0	15.76	20.34	3.69	4.61	95.2	111.6	5.70	11.98	17.76	4.34	103.1	7.18

Table 7. - Analyses of samples of cotton seed produced in Hueco County, Texas, September, 1930

Class	Percentage in class	Oil content		Ammonia content		Grade		Moisture		Weighted averages			
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Oil	Ammonia	Grade	Moisture
		Per cent	Per cent	Per cent	Per cent			Per cent	Per cent	Per cent	Per cent		Per cent
15	1.9	15.55	15.99	4.14	4.56	93.3	98.1	6.49	7.42	15.78	4.34	96.0	6.99
16	39.3	16.00	16.99	4.15	4.65	96.0	102.3	4.17	10.45	16.62	4.35	99.0	7.43
17	48.4	17.00	17.99	3.34	4.70	94.6	105.8	5.65	8.78	17.46	4.40	102.4	7.26
18	10.4	18.00	18.88	4.14	4.62	98.7	108.3	6.12	8.36	18.37	4.35	104.8	7.72
All classes	100.0	15.55	18.88	3.34	4.70	93.3	108.3	4.17	10.45	17.18	4.37	101.1	7.36

Table 8. - Analyses of samples of cotton seed produced in Nueces County, Texas, October 1930

Class	Percentage in class	Oil content		Ammonia content		Grade		Moisture		Weighted averages			
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Oil	Ammonia	Grade	Moisture
		Per cent	Per cent	Per cent	Per cent			Per cent	Per cent	Per cent	Per cent		Per cent
15	7.7	15.25	15.99	4.11	4.37	93.7	96.6	7.66	8.90	15.53	4.29	94.4	8.42
16	53.3	16.00	16.99	4.07	4.39	95.9	101.5	7.20	9.68	16.65	4.21	98.7	8.13
17	31.4	17.00	17.99	4.16	4.49	99.3	103.7	7.06	9.79	17.40	4.29	101.3	8.36
18	7.6	18.00	18.71	4.10	4.30	103.2	106.7	6.68	9.11	18.48	4.27	105.1	8.10
All classes	100.0	15.25	18.71	4.07	4.59	93.7	101.7	6.68	9.88	16.87	4.29	99.4	8.13

Table 9. - Available oil and 8-per-cent-ammonia cake per ton of cotton seed grown in Nueces County, Texas in 1930

Month	Available oil per ton of seed				Available cake, per ton of seed			
	Min.	Max.	Spread	Weighted average	Min.	Max.	Spread	Weighted average
	pounds	pounds	pounds	pounds	pounds	pounds	pounds	pounds
Aug.	330.2	419.8	89.6	390.2	893.3	1066.0	172.7	1003.6
Sept.	246.0	311.6	65.6	278.6	773.3	1086.8	313.6	1010.5
Oct.	240.0	309.2	69.2	273.4	941.1	1061.4	120.3	992.0

Table 10 is a summary of calculated relative values of the oil and cake yields from the cotton seed produced in Nueces County, Texas, in 1930.

That portion of the description of Basis Cotton Seed 6/ which affects the grade of cotton seed reads as follows: "Seed shall analyze 19.00 per cent oil and 3.5 per cent ammonia or its equivalent". By the formula previously stated this description will give available yields of 315 pounds of oil and 809.3 pounds of 8-per-cent-ammonia cake. For the purpose of this study the departures, more and less, from these pounds of oil and cake considered as basis yields for each class of analysis is given in respective columns.

The money value, loss, or gain, on the departures from the basis yields, for both the oil and the cake are shown in appropriate columns, the oil being calculated for the purpose of comparison, at 6.5 cents, and the cake at 1.4 cents a pound. $23.30 per ton is the assumed quotation for Basis Cotton Seed. The premiums and discounts for grade used are found by considering the grades of seed as percentages of the quotation for Basis Cotton Seed in determining the price paid per ton of seed.

In class 15 the weighted average grade was 95.3 and there was a net loss of 62 cents per ton over the average grade discount in the class.

In class 16 the weighted average grade was 99.0 and there was a net loss of 14 cents per ton in excess of the grade discount.

6/ Rule 40. Trading Rules National Cottonseed Products Association, 1930 - 1931.

In class 17 the weighted average grade was 102.3 and there was a net gain of 43 cents per ton in excess of the grade premiums.

In class 18 the weighted average grade was 105.1 and there was a net gain of 80 cents per ton in excess of the grade premium.

In class 19 the weighted average grade was 106.8 and there was a net gain of 86 cents in excess of and above the grade premium paid in this class.

In class 20 the weighted average grade was 108.0 and there was a net gain in excess of the grade premium paid of $1.16 per ton.

For the season there was a net gain of 23 cents on the products above the average grade premiums paid per ton of seed.

Table 10. - Comparative values of cotton seed produced in Russ a County, Texas, season of 1930

Item	Class 15	Class 16	Class 17	Class 18	Class 19	Class 20	All classes
Percentage of all analyses in class	1.80	29.40	44.70	20.10	1.60	3.40	100.00
Weighted average oil content, per cent	15.70	16.32	17.49	18.34	19.21	20.12	17.40
Weighted average ammonia content per cent	4.30	4.34	4.38	4.33	4.15	4.04	4.35
Available oil, pounds	249.00	267.40	284.50	301.40	319.20	337.40	283.00
Pounds of oil less than 315	66.00	47.60	30.20	13.20	----	----	32.00
Pounds of oil more than 315	----	----	----	----	4.20	22.40	----
Loss on oil, @ $0.065	$4.29	$3.09	$1.96	$0.86	----	----	$2.08
Gain on oil, @ $0.065	----	----	----	----	$0.27	$1.46	----
Available 8 per cent ammonia cake, pounds	994.30	1003.60	1012.80	1001.30	959.60	934.20	1005.90
Pounds of cake more than 800.3	185.00	194.30	203.50	192.00	150.30	124.90	196.60
Gain on cake, @ $0.014	$2.59	$2.72	$2.85	$2.69	$2.10	$1.75	$2.75
Weighted average grade	95.30	99.00	102.50	105.10	106.60	108.90	101.90
Grade discounts, basis $23.00	$1.08	$0.23	----	----	----	----	----
Grade premiums, basis $23.00	----	----	$0.46	$1.17	$1.51	$2.05	$0.44
Net loss, per ton of seed	$0.32	$0.14	----	----	----	----	----
Net gain per ton of seed	----	----	$0.43	$0.66	$0.86	$1.16	$0.23

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Conclusions

The principal conclusions to be reached from these data are:

1. Cotton seed vary widely in their content of oil and ammonia, during a season, as well as from season to season.

2. There is no positive relation between the content of the oil, ammonia, or moisture in cotton seed.

3. The oil and the ammonia content of cotton seed vary widely in relation to each other.

4. Low oil and ammonia content is not necessarily the result of high moisture content.

5. The weighted averages of oil and ammonia are frequently in an inverse ratio.

6. A grading plan, based on combinations of oil and ammonia has been devised for measuring the relative value of different lots of cotton seed.

7. Losses and gains in scales of grade discounts and premiums indicate that discounts should widen with decreases in grade, and that premiums should widen with increases in grade, if the price quoted for Basis Cotton Seed bears a relation to the value of the products obtainable, the working cost, overhead, and profit in handling.

8. During the season of 1930 there was a range of 18 grades between the lowest grade of cotton seed and the highest grade. This would indicate that under the current rate of premiums and discounts there was a difference of 18 per cent of the Basis Cotton Seed price in the value of different lots of cotton seed produced in Nueces County, Texas.

9. The weighted average grade of the cotton seed produced in Nueces County, Texas, for the season of 1930, was 101.9. Those who sold cotton seed produced in Nueces County, Texas, to the cotton seed oil mills, therefore received an average premium of 1.9 per cent above the average quotation for the basis grade.